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The Monocle Sign in FDG-PET

A Sign of Contralateral Facial Nerve Palsy

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Abstract: We report three cases of unilateral ^{18}F-FDG uptake in the orbicularis oculi muscle in subjects with contralateral peripheral facial nerve palsy. We argue that this asymmetric uptake pattern in fact reflects lack of metabolism on the side affected by facial nerve palsy, owing to denervation. Since the unilateral periorbital uptake resembles a monocle, we chose to call this finding the monocle sign. The monocle sign should not be confused with inflammation or tumor, but should prompt a neurological assessment for facial nerve palsy and a potential underlying disease.

Key Words: monocle sign, facial nerve palsy, orbicularis oculi muscle, ^{18}F-FDG, PET/CT

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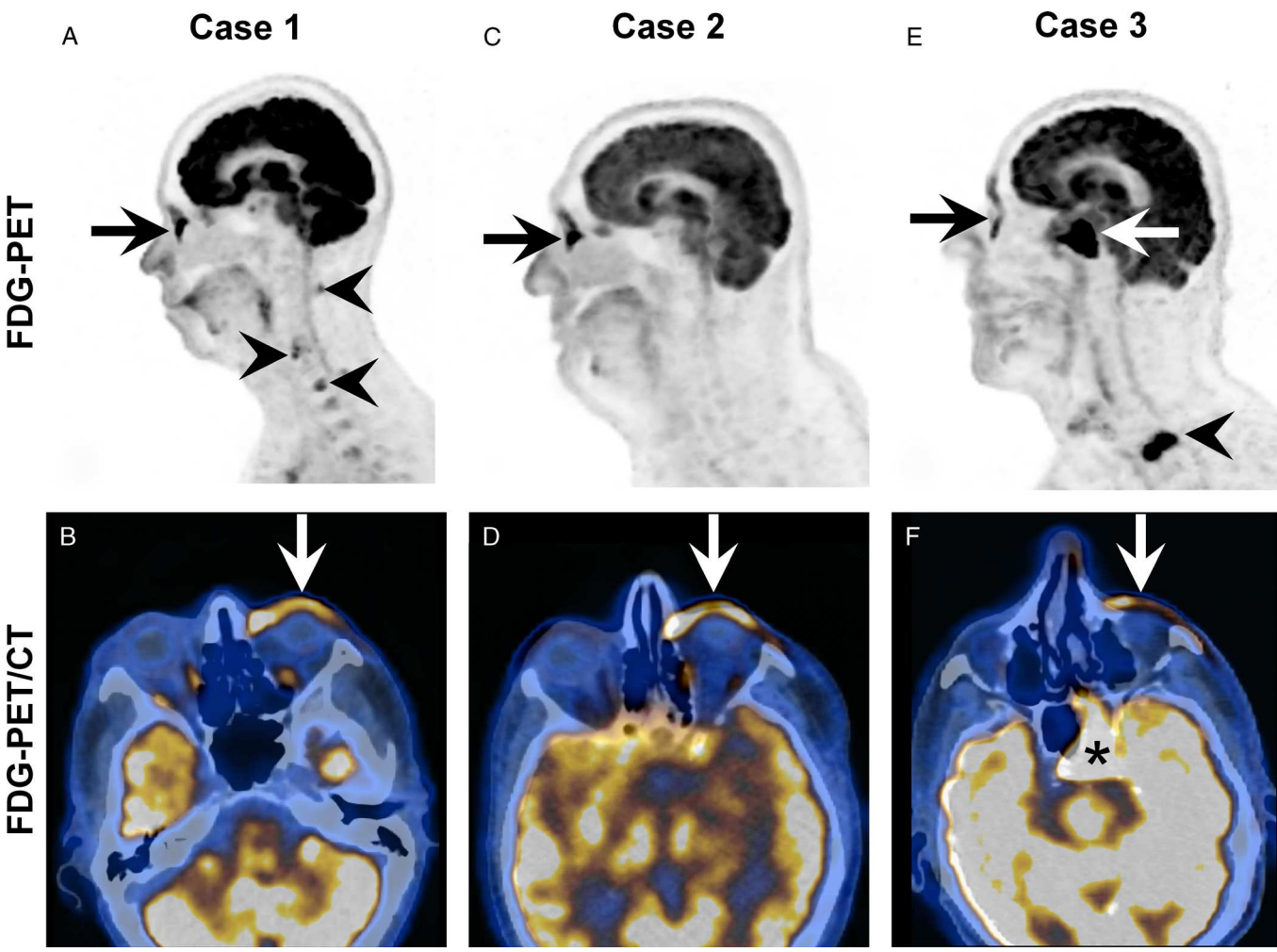

FIGURE 1. Case 1: ^{18}F-FDG PET/CT of a 69-year-old man with right-sided parotid gland cancer. The sagittal FDG-PET image (**A**) reconstructed with 27 mm slice thickness shows increased FDG uptake in the left-sided orbicularis oculi muscle (OOM; arrow). Several FDG-avid bone metastases (arrowheads) are seen as well. The axial fused PET/CT image (**B**) shows unilateral FDG uptake in the left-sided OOM (arrow; SUV_{max} 9.0). Clinically the patient presented with right-sided peripheral facial nerve palsy owing to nerve infiltration by the primary tumor. Case 2: 62-year-old man with bladder cancer. Unilaterally increased FDG uptake is seen in left-sided OOM (arrow; SUV_{max} 16.0) on the sagittal FDG-PET image (**C**) and on the axial fused PET/CT image (**D**; arrow). The patient had right-sided peripheral facial nerve palsy and vestibulocochlear nerve palsy caused by meningeal metastases in the internal auditory canal. Case 3: 72-year-old man with lung cancer. The sagittal FDG-PET image (**E**) shows increased FDG uptake in the left-sided OOM (arrow). FDG-avid bone metastases are seen in the thoracic spine (arrowhead) and in the clivus (white arrow). Axial fused PET/CT image (**F**) also displays unilaterally increased FDG uptake in the left-sided OOM (arrow; SUV_{max} 4.5), and a metastasis in the clivus (asterisk; SUV_{max} 12.9) infiltrating the sphenoid sinus. The patient suffered from right-sided peripheral facial nerve palsy caused by meningeal carcinomatosis. All three subjects had unilateral facial nerve palsy and increased FDG uptake in the contralateral OOM. The facial nerve innervates the mimic muscles, including the OOM.[1] This muscle is responsible for closing the eyelids and blinking.[2,3] Normal physiological uptake of the OOM is seen occasionally, however, uptake is typically bilaterally symmetric. During the resting phase before the PET scan, patients are advised to keep their eyes closed, in order to reduce uptake of the extraocular muscles. "Forced" closure of the eyelids may contribute to increased OOM uptake. The monocle-like FDG uptake pattern is presumably explained by missing uptake on the side affected by facial nerve palsy. In our experience, only a minority of patients with facial nerve palsy shows increased OOM uptake. However, if asymmetric or unilateral uptake is seen, facial nerve palsy should be suspected and prompt a neurological assessment and a search for a potential underlying disease. The monocle sign should be differentiated from focal unilateral FDG uptake seen in various malignant tumors (e.g., eyelid cancer, lymphoma, metastases) and periorbital cellulitis, which usually involves not the muscle but periorbital adipose tissue.[4–18] In general, periorbital FDG uptake due to overuse or physiological changes is typically diffuse and symmetric,[9,19,20] while FDG uptake due pathological causes is commonly focal and asymmetric.[4–18] Several cranial nerve palsies exhibit contralateral (often compensatory) increased FDG uptake of musculature. The most common finding is probably asymmetric FDG uptake in the vocal cord with recurrent laryngeal nerve palsy or vagal nerve palsy.[21] Asymmetric FDG uptake was also reported in extraocular muscles and tongue muscles in subjects with different contralateral cranial nerve palsies.[22,23] The monocle-like uptake pattern in patients with contralateral facial palsy is another such sign.